

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2019	
Course Name	Operating Systems	
Course Code	SFWR TECH 3OS3	
Date(s) and Time(s) of lectures	Tuesday 6:30 PM - 9:30 PM	
Program Name	Bachelor of Technology - Software Engineering Technology	
Calendar Description		
Instructor(s)	Alex Braun	E-Mail: abraun@mcmaster.ca Office Hours & Location: N/A

2. COURSE SPECIFICS

Course Description	This course gives students the theoretical understanding of how various aspects within an Operating System works. These concepts are applicable to the various Operating Systems that are being used in today's computing environments (Unix, IOs, Windows, Z/OS). Algorithms in the management of Memory, Disk Utilization, Process initiation as well as how to synchronise avoid process and disk deadlocks. Following this course students should have a solid understanding to have the ability to write their own Operating System.				
Instruction Type	Code	Type	Hours per term		
	C	Classroom instruction	36		
	L	Laboratory, workshop or fieldwork			
	E	Mid-term & Final Exam	4.5		
	DE	Distance education			
Total Hours					
Resources	ISBN	Textbook Title & Edition	Author & Publisher		
	ISBN: 978-1-119-45633-9 Or 978-1-119-32091-3 ISBN: 978-0-13-359162-0	Required: Operating Systems Concepts, 10th Optional: Modern Operating Systems, 4th	Silberschatz, Galvin, Gagne Publisher: Wiley Tanenbaum, Bos Publisher: Pearson		
	Other Supplies	Source			
Prerequisite(s)	N/A				
Corequisite(s)	N/A				
Antirequisite(s)	N/A				
Course Specific Policies					
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of "out-of-class" work for every scheduled hour in class. "Out-of-class" work includes reading, research, assignments and preparation for tests and examinations.				

	<p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>
3. SUB TOPIC(S)	
Week 1	Introduction & Operating Systems Structures
Week 2	Processes & Threads
Week 3	CPU Scheduling
Week 4	Process Synchronization
Week 5	Deadlocks
Week 6	Main Memory
Mid-term recess	
Week 7	Virtual Memory & Midterm Exam Review
Week 8	Mid-term Exam
Week 9	Mass-Storage Structure
Week 10	I/O Systems
Week 11	File System Interface & Implementation
Week 12	Protection & Security
Week 13	Operating Systems Testing Considerations & Exam Review
Classes Begin: September 3 2019	
Classes End: December 4 2019	
Final examination period: December 6 2019 - December 19 2019	
All examinations MUST BE written during the scheduled examination period.	
<p>Note that this structure represents a plan and is subject to adjustment term by term.</p> <p>The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>	
4. ASSESSMENT OF LEARNING *including dates*	Weight
Quizzes (10 - Weekly from Lecture 2 on, excluding last lecture)	10%
Investigative Discussion (10 - Weekly from Lecture 2 on, excluding last lecture)	10%
Assignments (10 - Weekly from Lecture 2 on, excluding last lecture)	20%
Midterm	20%
Final examination (tests cumulative knowledge)	40%
TOTAL	100%
Percentage grades will be converted to letter grades and grade points per the University calendar.	
5. LEARNING OUTCOMES	
1. Introduction & Operating System Structures	
a. Understand the types, organization and major components of computer systems and the operating systems that are used to manage them	
b. Understand the structure and services of an operating system and what they provide to users, processes and other systems	
2. Processes & Threads	

<ul style="list-style-type: none"> a. Understand what a process is, what its features b. Understand how communication plays a vital part of the operating system c. Understand what a thread is, including single and multithreaded units within a computer system d. Examine issues related to single threading and multithreading
3. CPU Scheduling <ul style="list-style-type: none"> a. Understand what is meant by CPU scheduling and how this is the basis for multi-programmed operating systems b. Understand various CPU scheduling algorithms and how they applied to several different operating systems
4. Process Synchronization <ul style="list-style-type: none"> a. Understand what is meant by process synchronization and how it relates to operating systems b. Understand the critical-section problem and various solutions to this problem such as Peterson's solution or use of synchronization hardware c. Use of other tools to solve process synchronization problems
5. Deadlocks <ul style="list-style-type: none"> a. Understand what a deadlock is b. Illustrate methods for preventing or avoiding deadlocks in a computer system
6. Main Memory <ul style="list-style-type: none"> a. Understand the various ways that memory can be organized b. Understand the methods by which memory can be allocated c. Understand paging in detail for contemporary computer systems
7. Virtual Memory & Midterm Review <ul style="list-style-type: none"> a. Understand what virtual memory is and what its benefits are b. Understand demand paging, page-replacement algorithms, and allocation of page frames c. Understand the relationship between shared memory and memory-mapped files d. Understand kernel memory
8. Mass-Storage Structure <ul style="list-style-type: none"> a. Describe and understand secondary storage devices b. Understand the performance characteristics of various secondary-storage devices c. Discuss and understand disk scheduling algorithms
9. I/O Systems <ul style="list-style-type: none"> a. Understand the structure of an operating systems I/O subsystem b. Understand the principles and complexities of I/O hardware c. Understand performance aspects in relation to I/O hardware and software
10. File System Interface & Implementation <ul style="list-style-type: none"> a. Understand the need and function of a file system b. Understand interfaces to the file system c. Understand file-system design, access methods, sharing, locking, and directory structures d. Explore file-system protection e. Understand implementing local file systems and directory structures f. Understand implementing remote file systems
11. Protection & Security <ul style="list-style-type: none"> a. Discuss goals and principals of protection in a modern computer system b. Explain how protection domains and access matrix's are used for resources management c. Discuss security threats and attacks d. Understand the fundamentals of encryption, authentication and hashing e. Examine cryptography in computing f. Discuss security attack countermeasures
12. Operating System Testing Considerations & Final Exam Review <ul style="list-style-type: none"> a. Discuss how different Operating Systems could be testing, given the various algorithms that can be implemented within various Operating Systems

b. Discuss considerations with respect to software development with dependencies on different operating systems available

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences **DUE TO MINOR MEDICAL SITUATIONS** that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately (**NORMALLY WITHIN TWO WORKING DAYS**) regarding the nature of the accommodation.

If you are absent **for reasons other than medical reasons**, **for** more than 3 days or exceed 1 request per term you **MUST** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. <http://www.mcmaster.ca/msaf/>

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to

<http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>